

***VARIABILITY OF VERTICAL VELOCITY AND CLOUD WATER IN MARINE  
STRATOCUMULUS: COMPARISON OF LES SIMULATIONS WITH  
OBSERVATIONS***

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**ABSTRACT**

A marine stratus deck sampled during the Marine Stratus/Stratocumulus Experiment (MASE) was simulated with a three-dimensional large eddy simulation (LES) model at different model resolutions. Variabilities in vertical velocity and cloud water from the model simulations were evaluated against those derived from the corresponding aircraft *in-situ* observations, focusing on standard deviation, skewness, kurtosis, probability density function (PDF), power spectrum, and structure function. The results show that although the LES model reasonably well captures the lower order moments (e.g., horizontal averages and standard deviations), it fails to simulate many aspects of the higher order moments, such as kurtosis, especially near cloud base and cloud top. Further investigations of the PDFs, power spectra, and structure functions reveal that compared to the observations, the model generally underestimates relatively strong variations on small scales. The results also suggest that increasing the model resolution improves agreement between model results and the observations in virtually all of the properties that were examined. Furthermore, the results indicate that a vertical grid size  $< 10$  m is necessary to accurately simulate even the standard-deviation profile, posing new challenges to computer resources.